OpenBDLM: An open-source Matlab software for Structural Health Monitoring using Bayesian dynamic linear models

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August 21, 2018

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What OpenBDLM does?

Install OpenBDLM

Data processing

- 3.1 Purpose
- 3.2 Input data format
- 3.3 Output data format
- 3.4 Merging timestamps vector
- 3.5 Data processing functions

Model building

- 4.1 Purpose
- 4.2 Model class
- 4.3 Dependencies
- 4.3.1 Observed covariate
- 4.3.2 Hidden covariate
- 4.4 Model components
- 4.4.1 Local level
- 4.4.2 Local trend
- 4.4.3 Local acceleration
- 4.4.4 Local level compatible trend
- 4.4.5 Local level compatible acceleration
- 4.4.6 Local trend compatible acceleration
- 4.4.7 Periodic
- 4.4.8 Kernel regression
- 4.4.9 Residual first order autoregressive
- 4.5 Model building functions

Model parameters learning

- 5.1 Purpose
- 5.2 Posterior
- 5.2.1 Prior
- 5.2.2 Likelihood
- 5.3 Model parameters bounds and transformed spaces
- 5.3.1 Logarithmic transformation
- 5.3.2 Sigmoid transformation
- 5.4 Gradient-based optimization techniques
- 5.4.1 Newton-Raphson approach
- 5.4.2 Stochastic Gradient Ascent approach
- 5.5 Constrain model parameters between each others
- 5.6 Model parameters learning functions

Hidden states estimation

- 6.1 Purpose
- 6.2 Kalman equations
- 6.3 UD computations
- 6.4 Filtering
- 6.5 Smoothing
- 6.6 Hidden states estimation functions

Data simulation

- 7.1 Purpose
- 7.2 Data simulation functions

Model validation

- 8.1 Purpose
- 8.2 Prediction capacity
- 8.3 Posterior model parameters covariance matrix analysis
- 8.4 Posterior state covariance matrix analysis
- 8.5 Residual component analysis
- 8.6 Model validation functions

Visualization tools

- 9.1 Purpose
- 9.2 Data availability plots
- 9.3 Hidden states plots
- 9.4 Export figures options
- 9.5 Visualization tools functions

Version control

- 10.1 Purpose
- 10.2 Version control functions

Examples

11.1 Example 1

Simulated data with: one time series, one model class, {[12 31 41]}.

11.2 Example 2

Simulated data with: two time series with dependencies, one model class, $\{[11\ 41], [11\ 31\ 41]\}.$

11.3 Example 3

Simulated data with one time series, two model classes, $\{[21\ 31\ 41]\}$ and $\{[12\ 31\ 41]\}$.

11.4 Example 4

Real data with one time series, one model class, {[12 51 41]}.

List of functions

Older versions

Last changes